1849MNRAS...9...51R

The large errors of the node and inclination at the epoch 1750–1755, probably arise from the neglect of the index error of Graham's quadrant, from 1750–1753, before mentioned.

On that Part of the Equation of Time which Depends on the Obliquity of the Ecliptic. By John Riddle, Esq.

"Let ω = obliquity; l = sun's longitude; a = sun's right ascension; δ = sun's declination.

Then $l - a = x$ = that part of the equation of time here spoken of.

Now, $\cos\omega = \tan a \, . \cot l,$

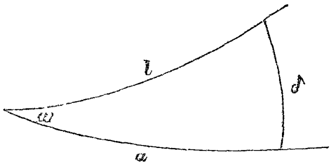
or

$$\frac{\cos\omega}{1} = \frac{\tan a}{\tan l}$$

$$\frac{1+\cos\omega}{1-\cos\omega} = \frac{\tan l + \tan a}{\tan l - \tan a};$$

or

$$\cot^2\frac{\omega}{2} = \frac{\sin(l+a)}{\sin(l-a)} = \frac{\sin(l+a)}{\sin x}$$



$$\therefore \sin x = \sin(l+a) \, . \tan^2\frac{\omega}{2}.$$

"From this it is evident that $\sin x$ and $x = 0$ when $\sin(l+a) = 0$, that is, when $l+a = 0$; 180°; 360°; or 540°; and these values of $l+a$ occur at the equinoxes and solstices.

"The greatest values of $\sin x$ and of x correspond to the greatest value of $\sin(l+a)$, viz. when

$$l+a = 90^\circ, 270^\circ, 450^\circ \text{ or } 630^\circ,$$

and $\sin(l+a) = 1, \quad -1, \quad 1 \text{ or } -1;$

which will give x alternately positive and negative; if X be the maximum value of x,

$$\sin X = \pm \tan^2\frac{\omega}{2} \ldots\ldots\ldots\ldots 1$$

"Again, when $l+a = 90^\circ$

$$2l - (l-a) = 90^\circ$$

or $2l - X = 90^\circ$

and $l = \frac{1}{2}(90^\circ + X) \ldots\ldots\ldots 2$

and $a = (90^\circ - l) \ldots\ldots\ldots 3$

"Also, when $x = X$,

$$\cos l = \cos a \, . \cos\delta$$

$$= \sin l \, . \cos\delta \quad (\cos a = \sin l, \text{ equat. } 3)$$

$$\therefore \cot l = \cos\delta \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4$$

"The equations (1), (2), (3), (4), furnish an easy means of finding

Downloaded from http://mnras.oxfordjournals.org/ by guest on March 21, 2015

© Royal Astronomical Society • Provided by the NASA Astrophysics Data System

1849MNRAS...9...52C

successively the quantities x, l, a, and δ, when x is at its maximum value. Collecting them we have

$$\begin{aligned} \sin X &= \tan^2 \frac{\omega}{2} \\ l &= \tfrac{1}{2}(90+X) \\ a &= 90-l \\ \cot l &= \cos \delta \end{aligned}$$

Let

$$\begin{aligned} \omega &= 23^{\circ}\ 27'\ 36'' \\ \frac{\omega}{2} &= 11\ \ 43\ \ 48 \\ \tan \frac{\omega}{2} &= \underline{9{\cdot}3173030} \\ \sin X &= \underline{\underline{8{\cdot}6346060}} \\ X &= \ \ 2^{\circ}\ 28'\ 15''{\cdot}5 \\ l &= 46\ \ 14\ \ \ 7{\cdot}75 \\ a &= 43\ \ 45\ \ 52{\cdot}25 \end{aligned}$$

l and a are found, almost by inspection, from x, and for δ,

$$\delta = \cos^{-1}(\cot l) = \cos^{-1}[\cot 46^{\circ}\ 14'\ 7''{\cdot}75] = 16^{\circ}\ 42'\ 32''.$$

"That some of the relations expressed are new, I have some reason to believe; they are certainly concise, and exhibit the dependance of the various quantities on each other, better than those which are usually given in the treatises on astronomy."

M. Rümker has sent a complete series of the meridian observations of the moon, made at the Observatory, Hamburg, between Jan. 3, 1845, and Feb. 16, 1848. The transits of the moon and moon-culminating stars have been generally observed over 13 wires, and the declinations of the stars and of the bright limb read off by 4 verniers. This and similar contributions are of great use, as affording accurate values of the errors of the lunar tables in reducing corresponding observations; and they are carefully preserved for that purpose.

The Rev. Temple Chevallier exhibited a volume, containing diagrams and observations of the Solar Spots, and expressed his intention of completing the same and presenting it to the Society.

Mr. Graham, of the Markree observatory, sends the following errata in Shortrede's logarithms:—

Antilog. of ·58643, *for* 8662, *read* 8602
Sin. 60° 18′ 25″ 8756, 8656

London:—Printed by George Barclay, Castle Street, Leicester Square.

Downloaded from http://mnras.oxfordjournals.org/ by guest on March 21, 2015

© Royal Astronomical Society • Provided by the NASA Astrophysics Data System